

WHAT IS CLAIMED IS:

1. ~~An image processing apparatus which embeds~~  
predetermined information in an image, the apparatus  
comprising:

- 5           input means for entering the image;  
          division means for dividing the entered image into  
          plural image areas;  
          quantization means for quantizing the image areas  
divided by said division means, utilizing error  
10          diffusion method; and  
          control means for controlling, in a unit of the  
image area, the quantization condition by said  
quantization means according to the predetermined  
information.

15           2. An image processing apparatus according to  
claim 1, wherein said quantization condition is a  
quantization threshold value.

20           3. An image processing apparatus according to  
claim 2, wherein said quantization condition changes  
the quantization threshold value based on a  
predetermined period.

25           4. An image processing apparatus according to  
claim 3, wherein said control means switches the  
predetermined period for changing the quantization

~~threshold value in the unit of said image area.~~

5        5. An image processing apparatus according to  
claim 4, wherein said control means switches the period  
in the horizontal direction and the period in the  
vertical direction for changing the quantization  
threshold value in the unit of the image area.

10       6. An image processing apparatus according to  
claim 3, wherein said control means has plural kinds of  
the predetermined periods and switches the  
predetermined period in the unit of the image area.

15       7. An image processing apparatus according to  
claim 1, wherein said predetermined information is  
audio information.

20       8. An image processing apparatus according to  
claim 1, wherein said predetermined information is  
information relating to the copyright of the image.

25       9. An image processing apparatus according to  
claim 1, wherein said predetermined information is  
added to the image in such a manner not easily visible  
to the human eye.

10. An image processing apparatus which extracts

~~predetermined information from an image in which the~~  
predetermined information is embedded, the apparatus  
comprising:

input means for entering the image;

5 transformation means for executing frequency  
transformation on the image areas divided by said  
division means;

10 classification means for classifying the image  
areas into plural classes based on the transformation  
process of said transformation means; and

extraction means for extracting the predetermined  
information, based on a feature amount of each class  
thus classified.

15 11. An image processing apparatus according to  
claim 10, wherein said frequency transformation is an  
orthogonal transformation.

20 12. An image processing apparatus according to  
claim 10, further comprising comparison means for  
comparing the feature amount of the classified classes;

wherein said extraction means extracts said  
predetermined information based on the result of  
comparison by said comparison means.

25 13. An image processing apparatus according to  
claim 10, further comprising:

~~evaluation means for evaluating a result of~~  
evaluation; and

re-division means for executing again the division  
process of said division means, based on the result of  
5 evaluation by said evaluation means.

14. An image processing apparatus according to  
claim 13, wherein said re-division means executes  
division again by changing the dividing position of the  
division.

15. An image processing apparatus according to  
claim 13, wherein said re-division means executes  
division again by changing a size of division.

16. An image processing apparatus according to  
claim 10, wherein said feature amount is the absolute  
value of coefficients of transformation by said  
transformation means.

17. An image processing apparatus according to  
claim 10, wherein said feature amount is electric  
power.

18. An image processing apparatus according to  
claim 10, wherein said predetermined information is  
audio information.

~~19. An image processing apparatus according to claim 10, wherein said predetermined information is information relating to copyright of the image.~~

5           20. An image processing apparatus according to claim 10, wherein said predetermined information is added to the image in such a manner not easily visible to human eyes.

10           21. An image processing method capable of embedding predetermined information in an image, the method comprising:

an input step of entering the image;

15           a division step of dividing the entered image into plural image areas;

a quantization step of quantizing the image areas divided by said division means, utilizing error diffusion method; and

20           a control step of controlling, in a unit of the image area, the quantization condition by said quantization step according to the predetermined information.

25           22. An image processing method according to claim 21, wherein said quantization condition is a quantization threshold value.

23. An image processing method according to claim 22, wherein said quantization condition changes the quantization threshold value based on a predetermined period.

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24. An image processing method according to claim 23, wherein said control step switches the predetermined period for changing the quantization threshold value in a unit of the image area.

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25. An image processing method according to claim 24, wherein said control step switches the period in the horizontal direction and the period in the vertical direction for changing the quantization threshold value in the unit of the image area.

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26. An image processing method according to claim 23, wherein said control step has plural kinds of the predetermined periods and switches the predetermined period in the unit of said image area.

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27. An image processing method according to claim 21, wherein said predetermined information is audio information.

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28. An image processing method according to claim 21, wherein said predetermined information is

~~information relating to the copyright of the image.~~

29. An image processing method according to claim  
21, wherein said predetermined information is added to  
5 the image in such a manner not easily visible to human  
eyes.

30. An image processing method which extracts  
predetermined information from an image in which the  
10 predetermined information is embedded, the method  
comprising:

an input step of entering the image;

a division step of dividing the entered image into  
plural image areas;

15 a transformation step of executing frequency  
transformation on the image areas divided by said  
division step;

a classification step of classifying the image  
areas into plural classes based on the transformation  
20 process of said information step; and

an extraction step of extracting the predetermined  
information, based on a feature amount of each class  
thus classified.

25 31. An image processing method according to claim  
30, wherein said frequency transformation is an  
orthogonal transformation.

32. An image processing method according to claim 30, further comprising a comparison step of comparing the feature amount of said classified classes;

5 wherein said extraction step extracts the predetermined information based on a result of comparison by said comparison step.

33. An image processing method according to claim 30, further comprising:

10 an evaluation step of evaluating a result of evaluation; and

15 a re-division means for executing again the division process of said division step, based on the result of evaluation by said evaluation step.

20 34. An image processing method according to claim 33, wherein said re-division step executes division again by changing the dividing position of the division.

25 35. An image processing method according to claim 33, wherein said re-division step executes division again by changing the size of division.

36. An image processing method according to claim 30, wherein said feature amount is the absolute value of the coefficients of transformation by said



transformation step.

37. An image processing method according to claim 30, wherein said feature amount is electric power.

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38. An image processing method according to claim 30, wherein said predetermined information is audio information.

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39. An image processing method according to claim 30, wherein said predetermined information is information relating to copyright of the image.

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40. An image processing method according to claim 30, wherein said predetermined information is added to the image in such a manner not easily visible to human eyes.

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41. A computer readable memory medium which stored program codes for embedding predetermined information in an image, the program codes comprising:

a code for entering the image;

a code for dividing the entered image into plural image areas;

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a code for quantizing the image areas divided by said division means, utilizing error diffusion method; and

~~a code for controlling, in the unit of the image~~  
area, the quantization condition by said quantization  
means according to the predetermined information.

5        42. A computer readable memory medium which  
stored program codes for extracting predetermined  
information from an image in which the predetermined  
information is embedded, the program codes comprising:

a code for entering said image;

10        a code for executing frequency transformation on  
the image areas divided by said division means;

a code for classifying said image areas into  
plural classes based on the transformation process of  
said transformation means; and

15        a code for extracting said predetermined  
information, based on a feature amount of each class  
thus classified.

20        43. An image processing apparatus which adds  
predetermined information to an image, comprising:

input means for entering the image;

division means for dividing the entered image into  
plural image areas;

25        quantization means for quantizing the image areas  
divided by said division means, utilizing an error  
diffusion method; and

power generation means for generating power of a  
predetermined frequency component in unit of the image  
area according to the predetermined information,

30        wherein the predetermined frequency component is a  
frequency component lower than a maximum frequency  
component generated by said quantization means.

44. An image processing method for adding  
predetermined information to an image, comprising:

an input step of entering the image;

5 a division step of dividing the entered image into  
plural image areas;

a quantization step of quantizing the image areas  
divided in said division step, utilizing an error  
diffusion method; and

10 a power generation step for generating power of a  
predetermined frequency component in unit of the image  
area according to the predetermined information,

wherein the predetermined frequency component is a  
frequency component lower than a maximum frequency

15 component generated in said quantization step.